

AP

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Appl. No. : 09/943,150 Confirmation No. 8646
Applicant : Daniel P. DeLuca et al.
Filed : August 30, 2001
TC/A.U. : 1742
Examiner : Harry D. Wilkins III

Docket No. : PA-086-07804-US(01-415)
Customer No. : 52237

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313

APPEAL BRIEF

Dear Sir:

This is an appeal to the Board of Patent Appeals and Interferences from the final rejection of claims 1, 4 - 11 and 24 - 28, dated October 19, 2006, made by the Primary Examiner in Tech Center Art Unit 1742.

REAL PARTY IN INTEREST

The real party in interest is United Technologies Corporation of Hartford, Connecticut.

RELATED APPEALS AND INTERFERENCES

There are no other appeals or interferences known to Appellants, Appellants' legal representative, or assignee which will

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directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

STATUS OF CLAIMS

Claims 1, 4 - 11 and 24 - 28 are pending in the application.

Claims 2, 3, and 12 - 23 have been previously cancelled.

A true copy of the claims on appeal is attached hereto in Appendix A.

STATUS OF AMENDMENTS

No amendment after final rejection was filed.

SUMMARY OF CLAIMED SUBJECT MATTER

Claim 1 on appeal is directed to a nickel base superalloy consisting of 3.0 to 12 wt% chromium, up to 3.0 wt% molybdenum, 3.0 to 10 wt% tungsten, less than 5.0 wt% rhenium, 6.0 to 12 wt% tantalum, 4.0 to 7.0 wt% aluminum, up to 15 wt% cobalt, up to 0.05 wt% carbon, up to 0.02 wt% boron, up to 0.1 wt% zirconium, up to 0.8 wt% hafnium, up to 2.0 wt% niobium, up to 1.0 wt% vanadium, up to 0.7 wt% titanium, up to 10 wt% of at least one element selected from the group consisting of ruthenium, rhodium, palladium, osmium, iridium, platinum, and mixtures thereof, and the balance essentially nickel (see page 1, last line to page 2, line 9 of the specification), said nickel base superalloy having a microstructure

which is pore free and eutectic γ - γ' free (see page 1, lines 27 - 29 of the specification), said microstructure having a gamma prime morphology which includes a bimodal γ' distribution having a uniform distribution of large γ' particles in a continuous gamma matrix and a second and uniform distribution of fine γ' particles within said matrix (see page 2, lines 10 - 23 of the specification).

Claim 4 on appeal is an independent claim and is directed to a nickel base superalloy consisting of 3.0 to 12 wt% chromium, up to 3.0 wt% molybdenum, 3.0 to 10 wt% tungsten, less than 5.0 wt% rhenium, 6.0 to 12 wt% tantalum, 4.0 to 7.0 wt% aluminum, up to 15 wt% cobalt, up to 0.05 wt% carbon, up to 0.02 wt% boron, up to 0.1 wt% zirconium, up to 0.8 wt% hafnium, up to 2.0 wt% niobium, up to 1.0 wt% vanadium, up to 0.7 wt% titanium, up to 10 wt% of at least one element selected from the group consisting of ruthenium, rhodium, palladium, osmium, iridium, platinum, and mixtures thereof, and the balance essentially nickel (see page 1, last line to page 2, line 9 of the specification), said nickel base superalloy having a microstructure which is pore free and eutectic γ - γ' free (see page 1, lines 27 - 29 of the specification), said microstructure having a gamma prime morphology which includes a bimodal γ' distribution, said bimodal γ' distribution including a uniform distribution of large γ' particles in a continuous gamma matrix and a second and uniform distribution of fine γ' particles (see page 2, lines 10 - 23 of the specification), said large γ' particles being octet shaped

and having an average particle size in the range of 1.0μ to 20μ and the fine γ' particles being cuboidal particles and having an average particle size in the range of from 0.45μ to 0.55μ (see page 6, line 23 to page 7, line 4 of the specification).

Claim 5 on appeal depends from claim 1 and claims that the nickel base superalloy is a single crystal nickel base superalloy (see page 1, lines 16 - 18 of the specification).

Claim 6 is an independent claim and is directed to a single crystal nickel base superalloy (see page 1, lines 16 - 18 of the specification): having a microstructure which is pore-free and eutectic $\gamma - \gamma'$ free and which has a gamma prime morphology which includes a bimodal γ' distribution (see page 1, lines 16 - 21 of the specification), the superalloy being capable of resisting initiation and subsequent propagation of fatigue cracks in a hydrogen environment (see page 7, line 18 to page 18, line 23 of the specification and FIGS. 5 - 7).

Claim 7 depends from claim 6 and claims that the bimodal γ' distribution includes large γ' particles having a particle size in the range of from 1.0μ to 20μ and fine γ' particles (see page 6, lines 21 - 26 of the specification).

Claim 8 depends from claim 7 and claims that the large γ' particles are present in an amount from 25 vol% to 50 vol% (see page 6, lines 26 - 28 of the specification).

Claim 9 depends from claim 7 and claims that the large γ' particles are present in an amount from 27 vol% to 45 vol% (see page 6, lines 26 - 28 of the specification).

Claim 10 is an independent claims and is directed to a single crystal nickel base superalloy having a microstructure which is pore-free and eutectic $\gamma - \gamma'$ free and a gamma prime morphology which includes a bimodal γ' distribution (see page 1, lines 16 - 21 of the specification) having large γ' particles with a particle size in the range of from 1.0μ to 20μ (see page 6, lines 21 - 26) and fine γ' particles, said fine γ' particles having a particle size in the range of from 0.45μ to 0.55μ (see page 7, lines 2 - 3 of the specification), the superalloy being capable of resisting initiation and subsequent propagation of fatigue cracks in a hydrogen environment (see page 7, line 18 to page 18, line 23 of the specification and FIGS. 5 - 7).

Claim 11 depends from claim 7 and is directed to the large γ' particles having an octet shape (see page 5, lines 17 - 21 of the specification) and said fine γ' particles having a cuboidal shape (see page 7, line 1 of the specification).

Claim 24 is an independent claim and is directed to an object formed from a single crystal nickel base alloy having a microstructure which is pore-free and eutectic $\gamma - \gamma'$ free, and which has a gamma prime morphology with a bimodal γ' distribution (see page 1, lines 16 - 21 of the specification), the alloy being capable

of resisting initiation and subsequent propagation of fatigue cracks in a hydrogen environment (see page 7, line 18 to page 18, line 23 of the specification and FIGS. 5 - 7).

Claim 25 depends from claim 24 and claims that the bimodal γ' distribution includes large γ' particles having an average particle size in the range of from 1μ to 20μ (see page 6, lines 21 - 26 of the specification) and fine γ' particles having an average particle size in the range of from 0.45μ to 0.55μ (see page 7, lines 2 - 3 of the specification).

Claim 26 depends from claim 24 and claims that the nickel base alloy has a composition comprising 3.0 to 12 wt% chromium, up to 3.0 wt% molybdenum, 3.0 to 10 wt% tungsten, up to 5.0 wt% rhenium, 6.0 to 12 wt% tantalum, 4.0 to 7.0 wt% aluminum, up to 15 wt% cobalt, up to 0.05 wt% carbon, up to 0.02 wt% boron, up to 0.1 wt% zirconium, up to 0.8 wt% hafnium, up to 2.0 wt% niobium, up to 1.0 wt% vanadium, up to 0.7 wt% titanium, up to 10 wt% of at least one element selected from the group consisting of ruthenium, rhodium, palladium, osmium, iridium, platinum, and mixtures thereof, and the balance essentially nickel (see page 1, last line to page 2, line 9 of the specification).

Claim 27 is an independent claim and is directed to a nickel base superalloy consisting of 3.0 to 12 wt% chromium, up to 3.0 wt% molybdenum, 3.0 to 10 wt% tungsten, less than 5.0 wt% rhenium, 6.0 to 12 wt% tantalum, 4.0 to 7.0 wt% aluminum, up to 15 wt% cobalt, up

to 0.05 wt% carbon, up to 0.02 wt% boron, up to 0.1 wt% zirconium, up to 0.8 wt% hafnium, up to 2.0 wt% niobium, up to 1.0 wt% vanadium, up to 0.7 wt% titanium, up to 10 wt% of at least one element selected from the group consisting of ruthenium, rhodium, palladium, osmium, iridium, platinum, and mixtures thereof, and the balance essentially nickel (see page 1, last line to page 2, line 9 of the specification), said nickel base superalloy having a microstructure which is pore free and eutectic γ - γ' free (see page 1, lines 16 - 21 of the specification), and said microstructure having a γ matrix phase and containing means for impeding preferential cracking in the γ matrix phase. As noted in the office action, the "means for impeding preferential cracking in the γ matrix phase" is in proper means-plus-function format and is defined in the specification at page 5, lines 17 - 21 as being the uniform distribution of large octet shaped γ' particles in the γ matrix phase and equivalents thereof

Claim 28 depends from claim 17 and claims that the impeding means comprises a uniform distribution of octet shaped γ' particles in the γ matrix phase (see page 5, lines 17 - 21 of the specification).

GROUND OF REJECTION TO BE REVIEWED ON APPEAL

The grounds of rejection to be reviewed on appeal are as follows:

The sole rejection on appeal is the rejection of claims 1, 4 - 11, and 24 - 28 under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 5,366,695 to Erickson in view of U.S. Patent No. 4,302,256 to Kenton and U.S. Patent No. 5,605,584 to DeLuca et al.

ARGUMENT

*(A) Claims 1 and 4 Are Patentable
Over The Combination of Erickson,
Kenton and DeLuca et al.*

Claim 1 is directed to a nickel base superalloy having a composition of from 3.0 to 12 wt% chromium, up to 3.0 wt% molybdenum, 3.0 to 10 wt% tungsten, less than 5.0 wt% rhenium, 6.0 to 12 wt% tantalum, 4.0 to 7.0 wt% aluminum, up to 15 wt% cobalt, up to 0.05 wt% carbon, up to 0.02 wt% boron, up to 0.1 wt% zirconium, up to 0.8 wt% hafnium, up to 2.0 wt% niobium, up to 1.0 wt% vanadium, up to 0.7 wt% titanium, up to 10 wt% of at least one element selected from the group consisting of ruthenium, rhodium, palladium, osmium, iridium, platinum, and mixtures thereof, and the balance essentially nickel. The nickel base superalloy also has a microstructure which is pore free and eutectic γ - γ' free. The microstructure has a gamma prime morphology which includes a bimodal γ' distribution having a uniform distribution of large γ' particles in a continuous gamma matrix and a second and uniform distribution of fine γ' particles within the matrix.

Claim 4 on appeal is an independent claim and is directed to a nickel base superalloy consisting of 3.0 to 12 wt% chromium, up to 3.0 wt% molybdenum, 3.0 to 10 wt% tungsten, less than 5.0 wt% rhenium, 6.0 to 12 wt% tantalum, 4.0 to 7.0 wt% aluminum, up to 15 wt% cobalt, up to 0.05 wt% carbon, up to 0.02 wt% boron, up to 0.1 wt% zirconium, up to 0.8 wt% hafnium, up to 2.0 wt% niobium, up to 1.0 wt% vanadium, up to 0.7 wt% titanium, up to 10 wt% of at least one element selected from the group consisting of ruthenium, rhodium, palladium, osmium, iridium, platinum, and mixtures thereof, and the balance essentially nickel, said nickel base superalloy having a microstructure which is pore free and eutectic γ - γ' free, said microstructure having a gamma prime morphology which includes a bimodal γ' distribution, said bimodal γ' distribution including a uniform distribution of large γ' particles in a continuous gamma matrix and a second and uniform distribution of fine γ' particles, said large γ' particles being octet shaped and having an average particle size in the range of 1.0μ to 20μ and the fine γ' particles being cuboidal particles and having an average particle size in the range of from 0.45μ to 0.55μ .

With regard to the obviousness rejection based upon the combination of the Erickson, Kenton, and DeLuca patents of record, this rejection is fatally flawed for a number of reasons. As noted in the Examiner's comments in the final rejection, Erickson teaches an alloy composition which includes from about 5.0 to 7.0 wt%

rhenium (see Abstract and claims 1 and 16) or about 5.5 to 6.5 wt% rhenium (see claims 12 and 28). Nowhere does Erickson teach or suggest a composition having less than 5.0 wt% rhenium. Thus, Erickson does not teach or suggest the composition set forth in independent claims 1 and 4. The Kenton and DeLuca patents relied upon by the Examiner do not cure the compositional deficiency of Erickson. Thus, for this reason alone, claims 1 and 4 are each allowable over the proposed combination of references.

With regard to the Examiner's analysis of the Erickson patent, Erickson never says what is meant by the word "about". Thus, one can not properly rely on vague language in a reference as an affirmative teaching of a claim limitation. A reference must disclose the subject matter with sufficient clarity and detail to establish that the subject matter existed in the prior art and that such existence would be recognized by persons of ordinary skill in the field of the invention. See *In re Spada*, 911 F.2d 705, 708, 15 USPQ2d 1655, 1657 (Fed. Cir. 1991); also see *Diversitech Corp. v. Century Steps, Inc.*, 850 F.2d 675, 678, 7 USPQ2d 1315, 1317 (Fed. Cir. 1988). It is submitted that the interpretation being applied by the Examiner is the Examiner's interpretation of Erickson's claim language. It is further submitted that this interpretation is not how one of ordinary skill in the art would view Erickson's teachings given Erickson's preference for rhenium contents above 5%. Thus, it can not be said that Erickson discloses an alloy containing rhenium

in an amount less than 5.0% with sufficient clarity that it would be recognized by persons of ordinary skill in the field of the invention. Again, as much as the Examiner wants to say that "about 5.0%" covers "less than 5.0%", this vague language could just as easily mean "5.1%". In fact, a fair reading of the preferred ranges in Erickson would lead one of ordinary skill in the art to conclude that Erickson teaches away from the claimed invention of having a composition with less than 5% rhenium.

The rejection is further defective in that Erickson does not teach one of ordinary skill in the art how to make and use an alloy of the above composition that is pore free. The Examiner attempts to overcome this deficiency by applying the Kenton patent. However, Kenton does not teach one how to form an alloy with the claimed composition that is pore free. As noted by the Examiner, Kenton teaches a HIP method which improves mechanical properties of alloys including the "substantially complete removal of defects such as micropores." Applicants again submit that this is not a teaching of how to make an alloy which has a pore-free microstructure. The fact that Kenton uses the terminology "substantially complete removal" instead of "complete removal" shows that alloys processed by the Kenton process do not have a pore-free microstructure. Any suggestion or comment that Kenton teaches a pore-free structure is pure speculation and conjecture.

In fact, neither Kenton nor Erickson express any desire to have a microstructure which is pore free. Since Kenton does not accomplish a pore-free microstructure, there is nothing which would motivate one of ordinary skill in the art to combine it with Erickson in the manner suggested by the Examiner. The motivation statement by the Examiner is wrong in that while Kenton may remove casting defects such as pores, it does not remove them in their entirety - hence, no pore-free microstructure.

Further, neither of these cited and applied references teaches or suggests how to form an alloy which is eutectic γ - γ' free. The Examiner's reliance on the desire of Erickson to fully solutionize the gamma prime phase as inherently meaning that the alloy is eutectic γ - γ' free is misplaced. In order to dissolve the eutectic γ' phase, special heat treatments are required. Neither Erickson nor Kenton disclose such heat treatments. It should be recognized by the Examiner that there is a cooling γ' phase which can be solutionized and later precipitated out. Since Erickson does not disclose a set of heat treatments for solutionizing out the eutectic γ' phase, it can not be said that it follows that the solutionizing performed by Erickson creates a microstructure which is eutectic γ - γ' free. For all anyone knows, Erickson is dealing with the cooling γ' phase. Thus, the Examiner's inherency argument fails. If the Examiner is going to rely on this inherency argument, then the Examiner must point out exactly where Erickson discloses the heat treatments

capable of dissolving the eutectic γ' phase. One can not establish inherency on the basis of mere probabilities or possibilities.

Assuming arguendo that the Examiner is correct and that fully solutionizing a composition would create the claimed eutectic $\gamma - \gamma'$ free microstructure, one of ordinary skill in the art reading Erickson would be led to believe that one has to use a chromium content less than the claimed 3%. A review of the fully solutionized compositions in Erickson (only those claiming 100% solutionization) show that composition 10E has 2.2% Cr; composition 10Gb has 2.3% Cr; composition 10I has 2.6% chromium; composition 12Ca has 2.5% Cr; and composition 12Ri has 2.65% Cr. These are the only compositions which were fully solutionized (the language "99.5 - 100" is believed to mean something less than 100% solutionization). Thus, it is Appellants' belief that Erickson teaches away from the $\gamma - \gamma'$ free microstructure of the claimed invention.

With regard to the DeLuca et al. patent, it does not cure the above-noted deficiencies of Erickson and Kenton. Still further, DeLuca relates to the treatment of alloys which do not contain rhenium and also relates to the formation of a trimodal γ' distribution.

Further with respect to claim 4, none of the references teach or suggest large octet shaped particles having the claimed particle size in combination with fine cuboidal particles having the claimed particle size. The Examiner contends that DeLuca et al. teaches

this, but such a contention is wrong. DeLuca et al. never discloses octet shaped particles. Such a contention is pure speculation. DeLuca et al. discloses particles with four branches; however, there is no disclosure of the shape of the branches. Each branch could have more than two sides. Further, the Examiner never address the issue of how one would modify Erickson to perform both the processing of Kenton and the heat treatments of DeLuca et al., which treatments are quite different from each other. The processing of an alloy is specific to its composition. The Examiner has not established that Erickson, Kenton and DeLuca et al. are processing alloys having the same compositions. In fact, the Examiner has not established that either Erickson or Kenton would have interest in doing what DeLuca et al. is doing. Appellants submit that the rejection of claim 4 is nothing more than a hindsight rejection at best.

For these reasons, claims 1 and 4 are further allowable.

*(B) Independent Claims 6, 10, and 24
Are Patentable Over the Combination of
Erickson, Kenton and DeLuca et al.*

Claim 6 is an independent claim and is directed to a single crystal nickel base superalloy having a microstructure which is pore-free and eutectic $\gamma - \gamma'$ free and which has a gamma prime morphology which includes a bimodal γ' distribution, the superalloy

being capable of resisting initiation and subsequent propagation of fatigue cracks in a hydrogen environment.

Claim 10 is an independent claims and is directed to a single crystal nickel base superalloy having a microstructure which is pore-free and eutectic $\gamma - \gamma'$ free and a gamma prime morphology which includes a bimodal γ' distribution having large γ' particles with a particle size in the range of from 1.0μ to 20μ and fine γ' particles, said fine γ' particles having a particle size in the range of from 0.45μ to 0.55μ , the superalloy being capable of resisting initiation and subsequent propagation of fatigue cracks in a hydrogen environment.

Claim 24 is an independent claim and is directed to an object formed from a single crystal nickel base alloy having a microstructure which is pore-free and eutectic $\gamma-\gamma'$ free, and which has a gamma prime morphology with a bimodal γ' distribution, the alloy being capable of resisting initiation and subsequent propagation of fatigue cracks in a hydrogen environment.

As can be seen from the foregoing, each of independent claims 6, 10, and 24 call for a single crystal nickel base alloy having a microstructure which is pore-free and eutectic $\gamma - \gamma'$ free and a gamma prime morphology which is bimodal. For the reasons stated in the previous section, which reasons are incorporated by reference herein, it is submitted that each of claims 6, 10, and 24 is allowable because none of the cited and applied references teach or

suggest how to form a nickel base alloy and/or an object formed from such an alloy having a microstructure which is pore free, eutectic γ - γ' free, and a gamma prime morphology which is bimodal.

Claims 6, 10 and 24 are further allowable because there is nothing which teaches or suggest a superalloy capable of resisting initiation and subsequent propagation of fatigue cracks in a hydrogen environment. The Examiner has not provided any convincing line of reasoning that the products taught by the references would inherently have the same response to fatigue cracks as claimed. The method of making the composition taught by Erickson in view of Kenton and DeLuca et al. is only substantially identical to the method disclosed in the specification. It is the differences between the methods which would lead one to conclude that the products formed by the present invention would have different properties than the products formed by the cited and applied references. It can not be said that the same resistance to initiation and propagation of fatigue cracks as claimed would inherently flow from an admitted different method. Inherency may not be established by probabilities or possibilities. The mere fact that a certain thing may result from a given set of circumstances is not sufficient. See *Continental Can Co. v. Monsanto Co.*, 948 F.2d 1264, 1268, 20 USPQ2d 1746, 1749 (Fed. Cir. 1991). The Examiner has provided no explanation as to why the claimed properties must inherently flow from the references.

Claim 10 is further allowable because the claimed particles sizes are not obvious from the cited and applied references. In the final rejection, the Examiner recognizes that Erickson and Kenton do not teach the particle size ranges. The Examiner attempts to cure this by pointing out that DeLuca et al has particles in a size which is covered by the claimed ranges. The Examiner then takes the position that it would have been obvious to one of ordinary skill in the art to have incorporated these particles in the Erickson alloy. Appellants submit that the proposed modification is defective for a number of reasons.

First, it should be recognized that the Examiner has not established that Erickson's alloys and DeLuca et al.'s alloys have the same compositions. Second, the Examiner's position ignores the fact that he has modified the processing in Erickson by Kenton's teachings. DeLuca et al. obtains its multi-modal particles by using particular heat treatments. Does the Examiner know suggest that one of ordinary skill in the art would somehow be motivated to substitute DeLuca et al.'s process for Kenton's or modify Kenton's process to perform DeLuca et al.'s process? Appellants submit that one of ordinary skill in the art would not be motivated to make such a combination. Certainly, Erickson and Kenton express no interest in doing what it is that DeLuca et al. does. Appellants submit that at best the Examiner has shown certain claimed features to be known in the art. However, this does not in and by itself establish

obviousness. In fact, the Examiner does not even address how one would, or could, modify Erickson in light of both Kenton and DeLuca. Appellants doubt that it is possible given the different nature of the alloy treatments expressed in Kenton and DeLuca et al. It is the Examiner's burden to establish a *prima facie* case of obviousness and this the Examiner has not done.

(C) Claim 5 Is Patentable

Regarding claim 5, this claim is allowable for the same reasons as claim 1, as well as the fact that none of the cited and applied references teaches or suggests a microstructure which is pore free, eutectic γ - γ' free, and bimodal. Appellant hereby incorporates by reference the discussion contained in section (A) on these issues.

*(D) Claims 7 - 9 and 25 Are Patentable
Over the Proposed Combination of References*

Claim 7 is directed to the bimodal γ' distribution including large γ' particles having a particle size in the range of from 1.0μ to 20μ and fine γ' particles.

Claim 8 calls for the large particles to be present in an amount from 25 vol% to 50 vol%.

Claim 9 calls for the large particles to be present in an amount from 27 vol% to 45 vol%.

Claim 25 calls for the bimodal γ' distribution to include large γ' particles having a particle size in the range of from 1.0μ to 20μ and fine γ' particles having an average particle size in the range of from 0.45μ to 0.55μ .

In the final rejection, the Examiner recognizes that Erickson and Kenton do not teach the particle size ranges and the volume percentages. The Examiner attempts to cure this by pointing out that DeLuca et al has large particles in a size which is covered by the claimed range and in a volume percent covered by the claimed ranges. The Examiner then takes the position that it would have been obvious to one of ordinary skill in the art to have incorporated these particles in the Erickson alloy. Appellants submit that the proposed modification is defective for a number of reasons.

First, it should be recognized that the Examiner has not established that Erickson's alloys and DeLuca et al.'s alloys have the same compositions. Second, the Examiner's position ignores the fact that he has modified the processing in Erickson by Kenton's teachings. DeLuca et al. obtains its multi-modal particles by using particular heat treatments. Does the Examiner know suggest that one of ordinary skill in the art would somehow be motivated to substitute DeLuca et al.'s process for Kenton's or modify Kenton's process to perform DeLuca et al.'s process? Appellants submit that one of ordinary skill in the art would not be motivated to make such

a combination. Certainly, Erickson and Kenton express no interest in doing what it is that DeLuca et al. does. Appellants submit that at best the Examiner has shown certain claimed features to be known in the art. However, this does not in and by itself establish obviousness. In fact, the Examiner does not even address how one would modify Erickson in light of both Kenton and DeLuca. Appellants doubt that it is possible given the different nature of the alloy treatments expressed in Kenton and DeLuca et al. It is the Examiner's burden to establish a *prima facie* case of obviousness and this the Examiner has not done.

*(E) Claims 11 and 28 Are
Allowable Over The Combination
Of Erickson, Kenton and DeLuca et al.*

It is further submitted that none of the cited and applied references teach or suggest forming large γ' particles which are octet shaped and/or which are in combination with fine γ' particles which are cuboidal in shape. Clearly, Erickson and Kenton are silent on the issue of octet shaped particles. With respect to the DeLuca patent, it should be noted that lines 44 and 45 in column 3 of the DeLuca patent does not mean that the particles are octet shaped. An octet shape has eight sides. A particle with four branches could have more than eight sides or facets. For example, a four branched particle could have twelve sides or facets depending on the shape of each particle branch. The Examiner's conclusion

that this section of DeLuca means that the particles necessarily have an octet shape is nothing more than conjecture or speculation. For these reasons, claims 11 and 28 are allowable.

(F) Claim 26 Is Allowable

Claim 26 calls for the nickel base alloy to have a particular composition. It is submitted that this claim is allowable because none of the references teach or suggest the claimed composition in combination with the subject matter of claim 24.

*(G) Independent Claim 27 is Allowable Over
The Combination of Erickson, Kenton, and DeLuca et al.*

Claim 27 is directed to a nickel base superalloy consisting of 3.0 to 12 wt% chromium, up to 3.0 wt% molybdenum, 3.0 to 10 wt% tungsten, less than 5.0 wt% rhenium, 6.0 to 12 wt% tantalum, 4.0 to 7.0 wt% aluminum, up to 15 wt% cobalt, up to 0.05 wt% carbon, up to 0.02 wt% boron, up to 0.1 wt% zirconium, up to 0.8 wt% hafnium, up to 2.0 wt% niobium, up to 1.0 wt% vanadium, up to 0.7 wt% titanium, up to 10 wt% of at least one element selected from the group consisting of ruthenium, rhodium, palladium, osmium, iridium, platinum, and mixtures thereof, and the balance essentially nickel, said nickel base superalloy having a microstructure which is pore free and eutectic γ - γ' free, and said microstructure having a γ matrix phase and containing means for impeding preferential cracking in the γ matrix phase.

Claim 27 is allowable because none of the cited and applied references teach or suggest the claimed composition and a pore free and eutectic $\gamma - \gamma'$ free microstructure. Appellants hereby incorporate the remarks from section (A) above on these issues.

Further with respect to claim 27, it should be noted that none of the cited and applied references teach or suggest how to form a microstructure having the claimed impeding means. The Examiner has not pointed to any portion of any reference which talks about creating means for impeding preferential cracking in the γ matrix phase in combination with the other features of claim 27. Certainly, having such an impeding means is not anything of interest to Erickson and/or Kenton et al.

For these reasons, independent claim 27 is allowable.

(H) Response to Examiner's Arguments

With regard to the Examiner's comments in paragraph 4a of the office action, the Board is directed to Appellants' previous comments about the deficiencies of the Erickson patent.

With regard to the Examiner's comments in paragraph 4b of the office action, the Examiner misses the point that Kenton is not similar in composition and in microstructure to what is being claimed. The Examiner is merely using Kenton to show a particular processing feature. Thus, one of ordinary skill in the art would have no expectation that the Kenton process would arrive at the

claimed microstructure which is pore-free. The citation of *In re Best* is duly noted, but this case is inapplicable because the claimed product is not identical or substantially identical to either the product in Erickson or in Kenton.

With regard to the Examiner's comments in paragraph 4c, the Examiner has still not addressed the absence of the required heat treatments in Erickson which would lead to the alloy being eutectic $\gamma - \gamma'$ free. Clearly, Appellants who are experienced metallurgists, who develop alloys day in and day out, would have a better understanding of this than the Examiner. If the Examiner is going to maintain his reliance on this inherency argument, then the Examiner needs to provide a line of technical reasoning to support his position instead of a summary conclusion. This, the Examiner has not done.

With regard to the Examiner's comments in paragraph 4d, one of ordinary skill in the art would be lead to limit the chromium content below 3.0 wt% because those are the only alloys which Erickson fully solutionizes. Assuming arguendo that the Erickson teaches the required heating treatments to fully solutionize the alloy, then the Examiner must accept the full teaching which is that the alloy must have a chromium content of less than 3.0 wt%. In other words, the Examiner can not "cherry pick" the reference to take out the teachings which he deems to be helpful to his position, while ignoring the rest of the teachings in Erickson.

With regard to the Examiner's comments in paragraph 4e, it is true that DeLuca et al discloses trimodal distribution but then says that in some case one could have bimodal distribution. The issue however is why would one of ordinary skill in the art be motivated to modify Erickson by Kenton's treatments and then further modify this combination by DeLuca et al.'s treatments. There is absolutely no reason why one would be so motivated. It is submitted that this rejection is clearly a hindsight rejection based on what is being claimed.

With regard to the Examiner's comments in paragraph 4f, the fact remains that DeLuca does not teach an octet shaped particle. The Examiner merely assumes that DeLuca's particles have the same shape. Such assumption is without merit. Still further, the Examiner not provided any reason why Erickson would be interested in having large particles which are octet shaped. With respect to the Examiner's comments about Appellants' argument being mere speculation, it should be noted that the same can be said of the Examiner's position.

CONCLUSION

For the foregoing reasons, the Board is hereby requested to reverse the rejection of claims 1, 4 - 11 and 24 - 28 and remand the instant application back to the Primary Examiner for allowance and issuance.

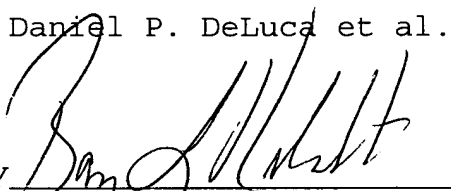
APPEAL BRIEF FEE AND EXTENSION OF TIME

The Director is hereby authorized to charge the Appeal Brief Fee of \$500.00 to Deposit Account No. 21-0279. Should the Commissioner determine that an additional fee is due, he is hereby authorized to charge said additional fee to said Deposit Account.

Respectfully submitted,

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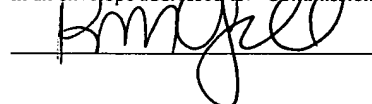
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IN TRIPLICATE

Date: March 19, 2007

I, Karen M. Gill, hereby certify that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to: "Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313" on **March 19, 2007**.





CLAIMS ON APPEAL - APPENDIX A

1. A nickel base superalloy consisting of 3.0 to 12 wt% chromium, up to 3.0 wt% molybdenum, 3.0 to 10 wt% tungsten, less than 5.0 wt% rhenium, 6.0 to 12 wt% tantalum, 4.0 to 7.0 wt% aluminum, up to 15 wt% cobalt, up to 0.05 wt% carbon, up to 0.02 wt% boron, up to 0.1 wt% zirconium, up to 0.8 wt% hafnium, up to 2.0 wt% niobium, up to 1.0 wt% vanadium, up to 0.7 wt% titanium, up to 10 wt% of at least one element selected from the group consisting of ruthenium, rhodium, palladium, osmium, iridium, platinum, and mixtures thereof, and the balance essentially nickel, said nickel base superalloy having a microstructure which is pore free and eutectic γ - γ' free, said microstructure having a gamma prime morphology which includes a bimodal γ' distribution having a uniform distribution of large γ' particles in a continuous gamma matrix and a second and uniform distribution of fine γ' particles within said matrix.

4. A nickel base superalloy consisting of 3.0 to 12 wt% chromium, up to 3.0 wt% molybdenum, 3.0 to 10 wt% tungsten, less than 5.0 wt% rhenium, 6.0 to 12 wt% tantalum, 4.0 to 7.0 wt% aluminum, up to 15 wt% cobalt, up to 0.05 wt% carbon, up to 0.02 wt% boron, up to 0.1 wt% zirconium, up to 0.8 wt% hafnium, up to 2.0 wt% niobium, up to 1.0 wt% vanadium, up to 0.7 wt% titanium, up to 10 wt% of at least one element selected from the group consisting of ruthenium, rhodium, palladium, osmium, iridium, platinum, and mixtures thereof, and the balance essentially nickel, said nickel base superalloy having a microstructure which is pore free and eutectic γ - γ' free, said microstructure having a gamma prime morphology which includes a bimodal γ' distribution, said bimodal γ' distribution including a uniform distribution of large γ' particles in a continuous gamma matrix and a second and uniform distribution of fine γ' particles, said large γ' particles being octet shaped and having an average

particle size in the range of 1.0μ to 20μ and the fine γ' particles being cuboidal particles and having an average particle size in the range of from 0.45μ to 0.55μ .

5. A nickel base superalloy according to claim 1, wherein said nickel base superalloy is a single crystal nickel base superalloy.

6. A single crystal nickel base superalloy having a microstructure which is pore-free and eutectic $\gamma - \gamma'$ free and which has a gamma prime morphology which includes a bimodal γ' distribution, the superalloy being capable of resisting initiation and subsequent propagation of fatigue cracks in a hydrogen environment.

7. A single crystal nickel base superalloy according to claim 6, wherein said bimodal γ' distribution includes large γ' particles having a particle size in the range of from 1.0μ to 20μ and fine γ' particles.

8. A single crystal nickel base superalloy according to claim 7, wherein said large γ' particles are present in an amount from 25 vol% to 50 vol%.

9. A single crystal nickel base superalloy according to claim 7, wherein said large γ' particles are present in an amount from 27 vol% to 45 vol%.

10. A single crystal nickel base superalloy having a microstructure which is pore-free and eutectic $\gamma - \gamma'$ free and a gamma prime morphology which includes a bimodal γ' distribution having large γ' particles with a particle size in the range of from 1.0μ to 20μ and fine γ' particles, said fine γ' particles having a particle size in the range of from 0.45μ to 0.55μ , the superalloy being capable of

resisting initiation and subsequent propagation of fatigue cracks in a hydrogen environment.

11. A single crystal nickel base superalloy according to claim 7, wherein said large γ' particles have an octet shape and said fine γ' particles have cuboidal shape.

24. An object formed from a single crystal nickel base alloy having a microstructure which is pore-free and eutectic γ - γ' free, and which has a gamma prime morphology with a bimodal γ' distribution, the alloy being capable of resisting initiation and subsequent propagation of fatigue cracks in a hydrogen environment.

25. An object according to claim 24, wherein the bimodal γ' distribution includes large γ' particles having an average particle size in the range of from 1μ to 20μ and fine γ' particles having an average particle size in the range of from 0.45μ to 0.55μ .

26. An object according to claim 24, wherein said nickel base alloy has a composition comprising 3.0 to 12 wt% chromium, up to 3.0 wt% molybdenum, 3.0 to 10 wt% tungsten, up to 5.0 wt% rhenium, 6.0 to 12 wt% tantalum, 4.0 to 7.0 wt% aluminum, up to 15 wt% cobalt, up to 0.05 wt% carbon, up to 0.02 wt% boron, up to 0.1 wt% zirconium, up to 0.8 wt% hafnium, up to 2.0 wt% niobium, up to 1.0 wt% vanadium, up to 0.7 wt% titanium, up to 10 wt% of at least one element selected from the group consisting of ruthenium, rhodium, palladium, osmium, iridium, platinum, and mixtures thereof, and the balance essentially nickel.

27. A nickel base superalloy consisting of 3.0 to 12 wt% chromium, up to 3.0 wt% molybdenum, 3.0 to 10 wt% tungsten, less than 5.0 wt% rhenium, 6.0 to 12 wt% tantalum, 4.0 to 7.0 wt% aluminum, up to 15

wt% cobalt, up to 0.05 wt% carbon, up to 0.02 wt% boron, up to 0.1 wt% zirconium, up to 0.8 wt% hafnium, up to 2.0 wt% niobium, up to 1.0 wt% vanadium, up to 0.7 wt% titanium, up to 10 wt% of at least one element selected from the group consisting of ruthenium, rhodium, palladium, osmium, iridium, platinum, and mixtures thereof, and the balance essentially nickel, said nickel base superalloy having a microstructure which is pore free and eutectic γ - γ' free, and said microstructure having a γ matrix phase and containing means for impeding preferential cracking in the γ matrix phase.

28. The nickel base superalloy of claim 27, wherein said impeding means comprises a uniform distribution of octet shaped γ' particles in the γ matrix phase.

EVIDENCE - APPENDIX B

NOT APPLICABLE

RELATED PROCEEDINGS - APPENDIX C

NOT APPLICABLE